

Sediment Dredging & Dewatering Technologies

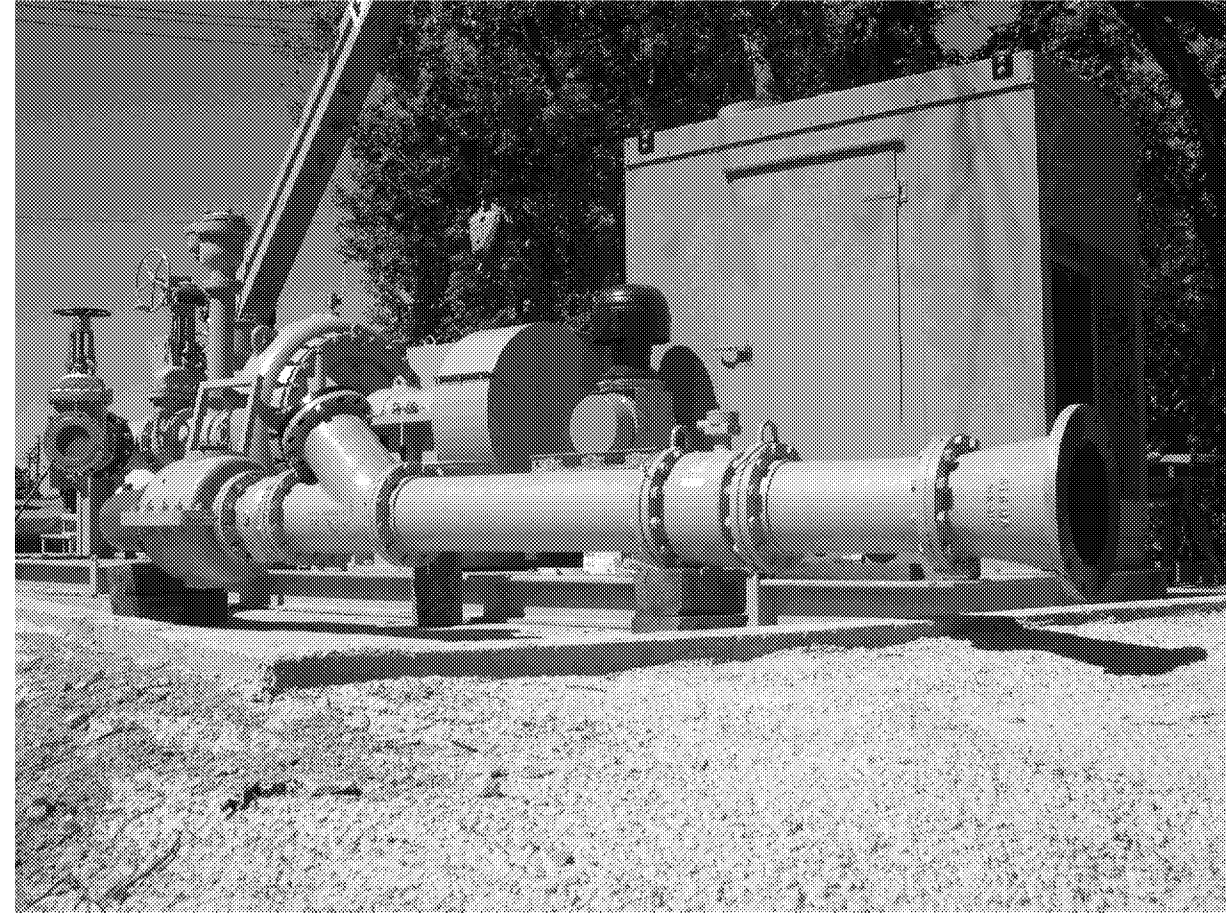
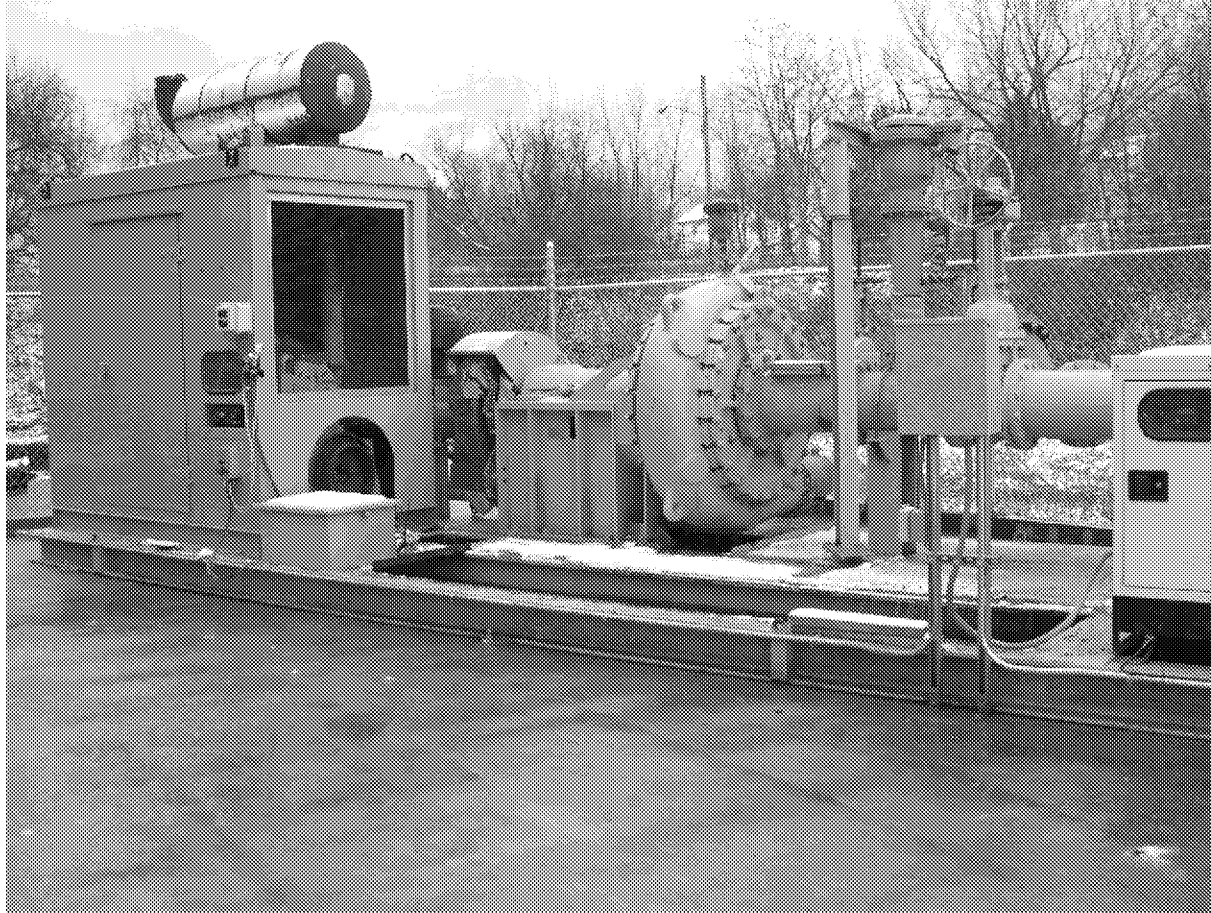
Gorge Dam GLLA Project



Hydraulic Dredge



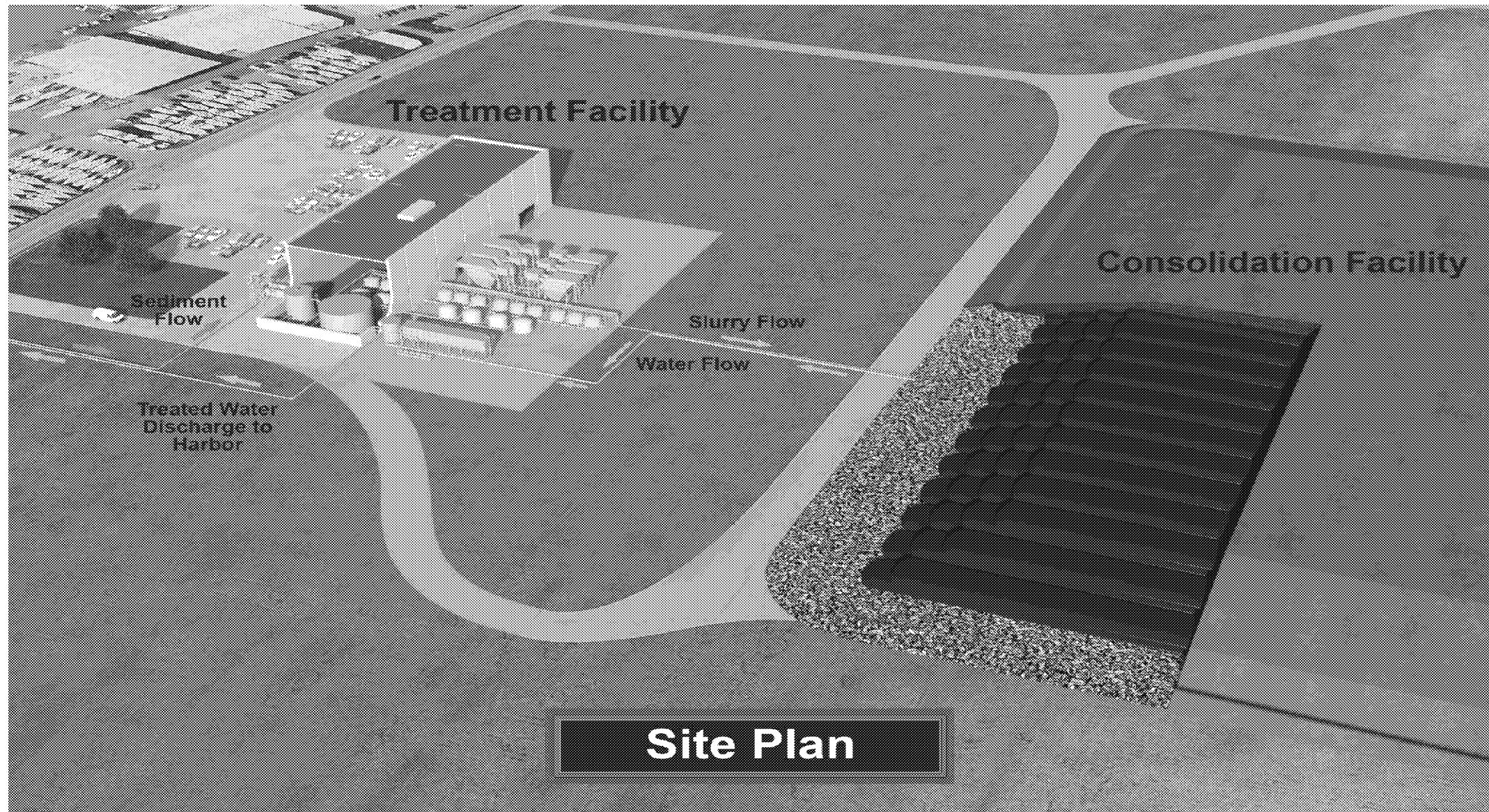
Booster Pump



Geotextile Tube Dewatering

- Sediment slurry consisting of 15-20% solids is pumped from dredge to the dewatering pad (Chuckery Area)
- Sediment is chemically conditioned to promote separating of the water and solids
- Solids remain trapped in the geotextile tubes while allowing water to pass through the fabric.
- Water is collected, treated, and discharged to a wastewater treatment plant or local water body

Geotextile Tube Dewatering



Dewatering Pad

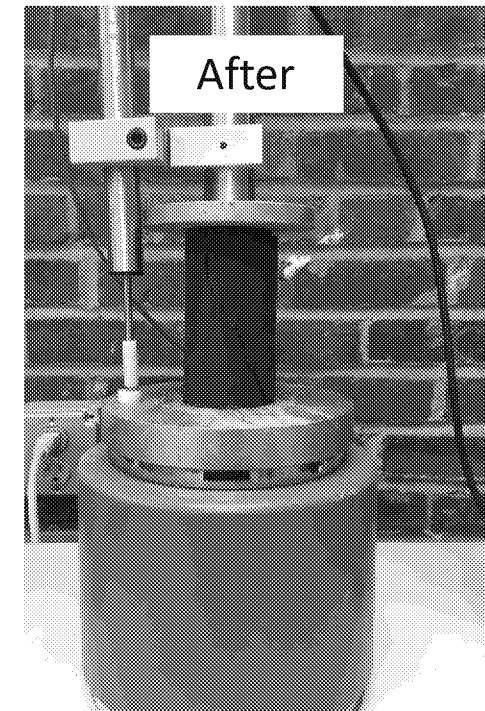


Geotextile Tube Dewatering



Stabilization/Solidification

- Solidification/stabilization (S/S) is a well-established strategy for the treatment, dewatering and improvement for:
 - contaminated sediments
 - industrial residues
 - **slurries, waste lagoon sludges, and several waste materials**
- The practice uses a binder to render the material acceptable for transport, disposal or potentially beneficial use
- The US Environmental Protection Agency has completed several remedial actions using S/S as the primary treatment technology. It has been shown to be effective for a wide variety of organic and inorganic contaminants found in contaminated sediment, soil, and other waste types



Standard Mixing of Portland Cement vs Pneumatic Flow Tube Mixing

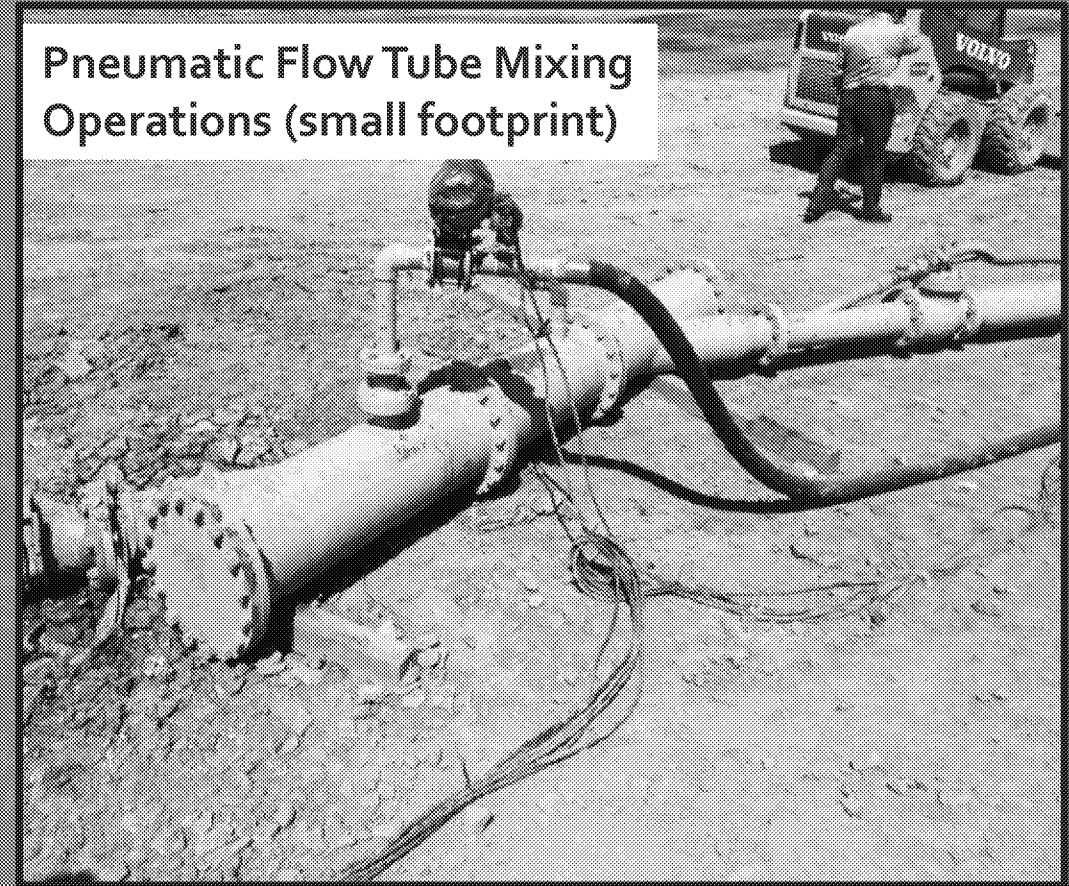
Bellingham, Washington USA
Squalicum Harbor



Open area excavation mixing

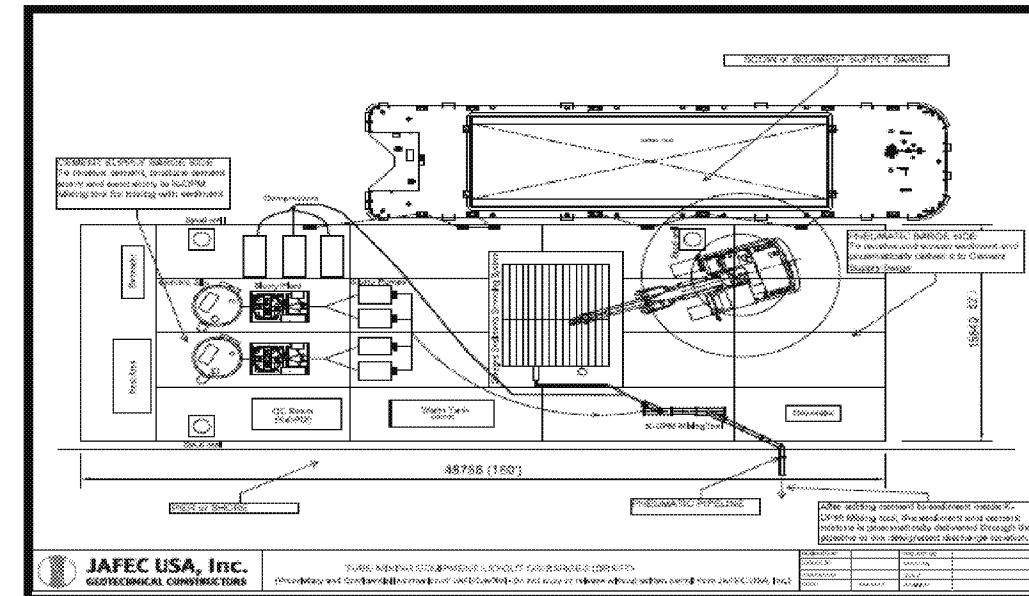
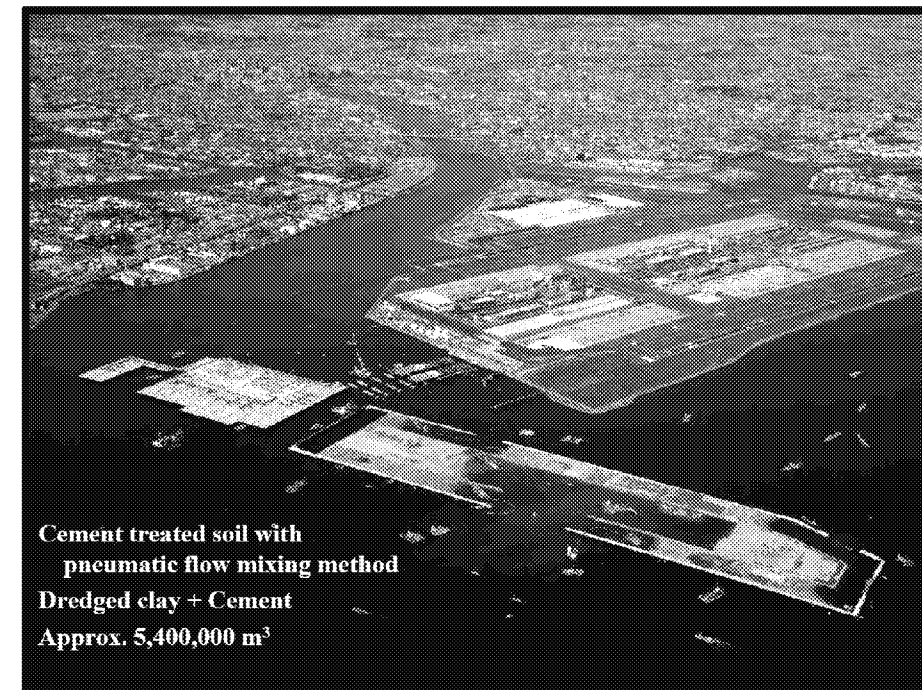
- Large footprint
- Limited control of binder dose
- Open air emissions
- Exposure

Pneumatic Flow Tube Mixing
Operations (small footprint)



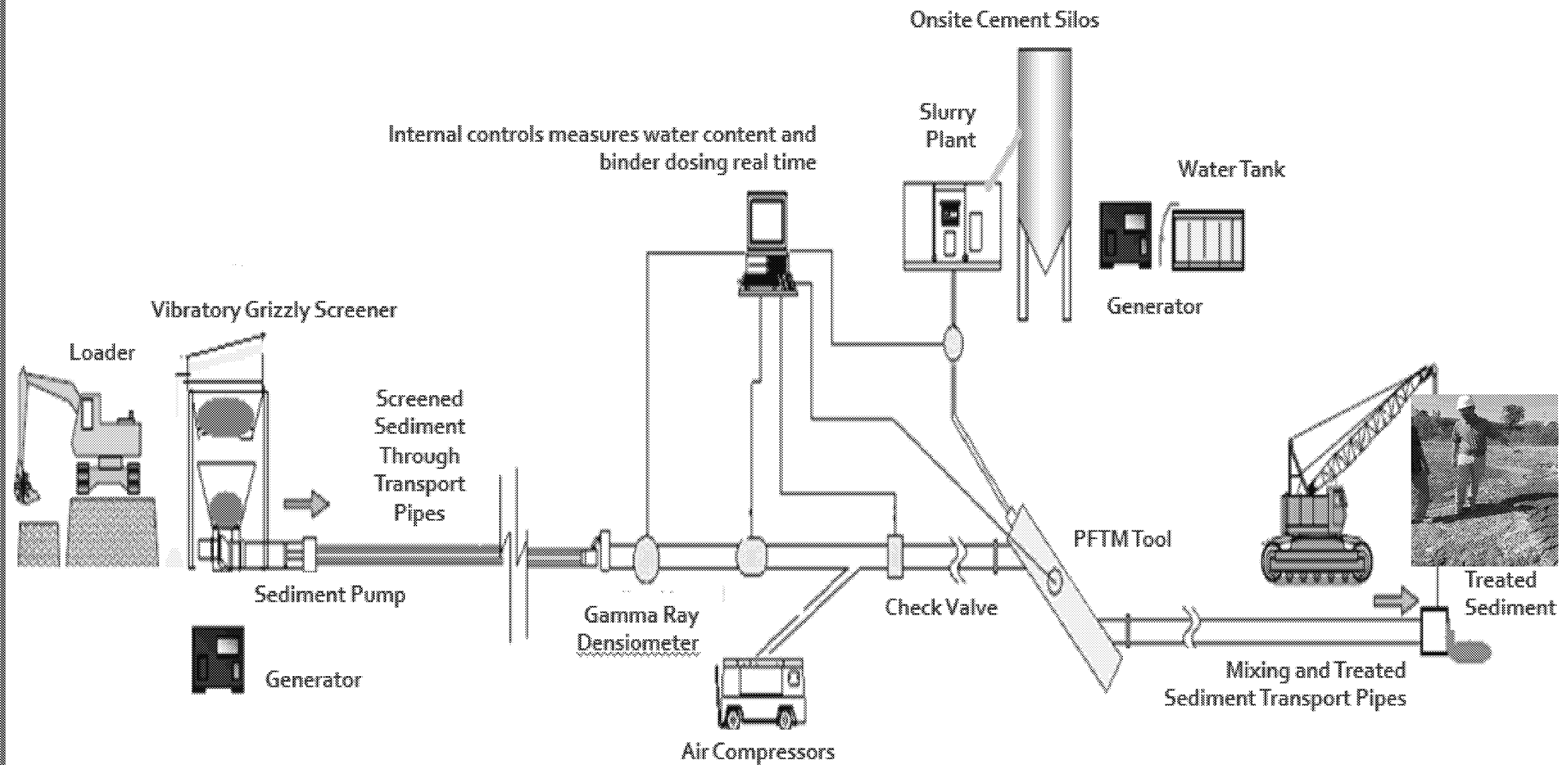
Pneumatic Flow Tube Mixing (PFTM)

- Ground improvement technique developed in Japan in early 2000 for large scale reclamation projects using fine silty clay sediments.
- Completely enclosed mixing system with no air or water discharges.
- Small footprint that allows maximum flexibility during operations in challenging environments
- Extremely efficient mixing/utilization of binder which results in higher quality end product
- Low Cost. PFTM is an automated system that requires relatively few operators and eliminates the need for additional handling steps during pro



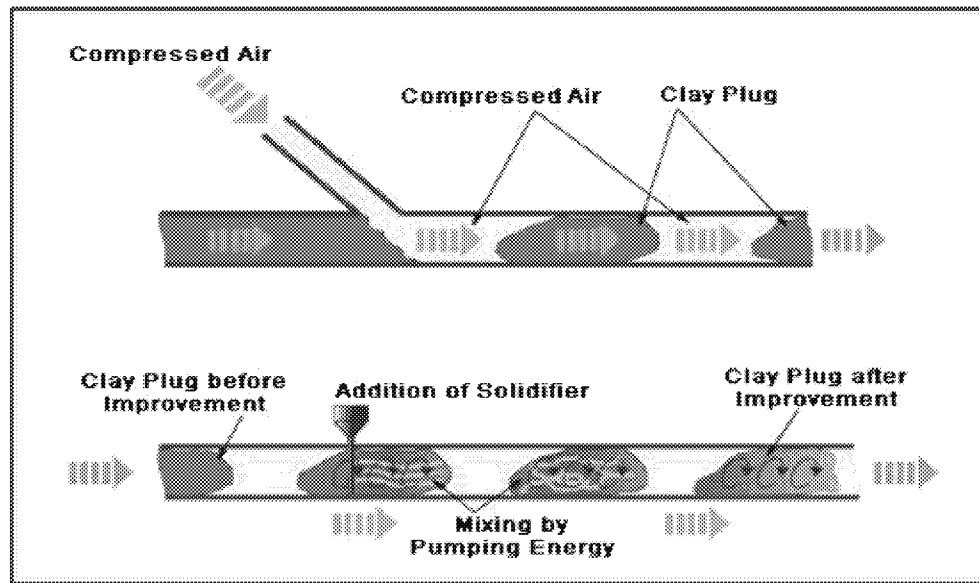
PFTM Layout on 160' x 62' barge

PFTM Process Flow (Detailed)



Pneumatic Flow Tube Mechanism

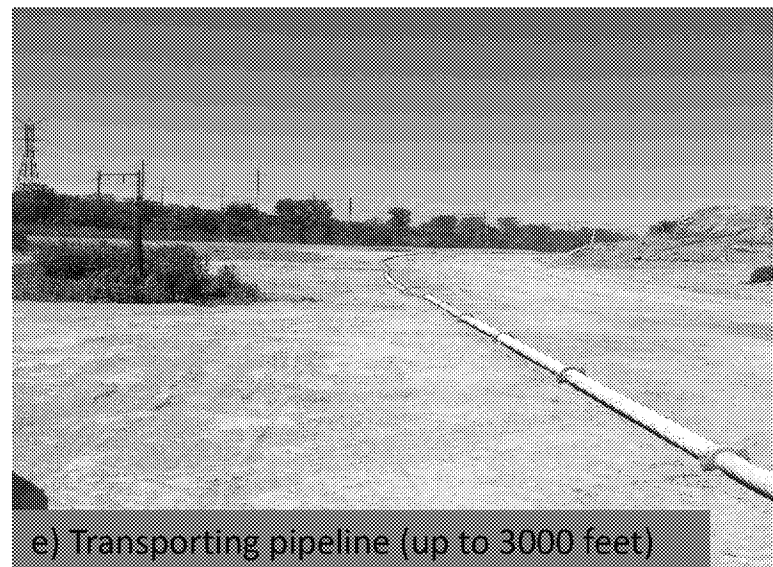
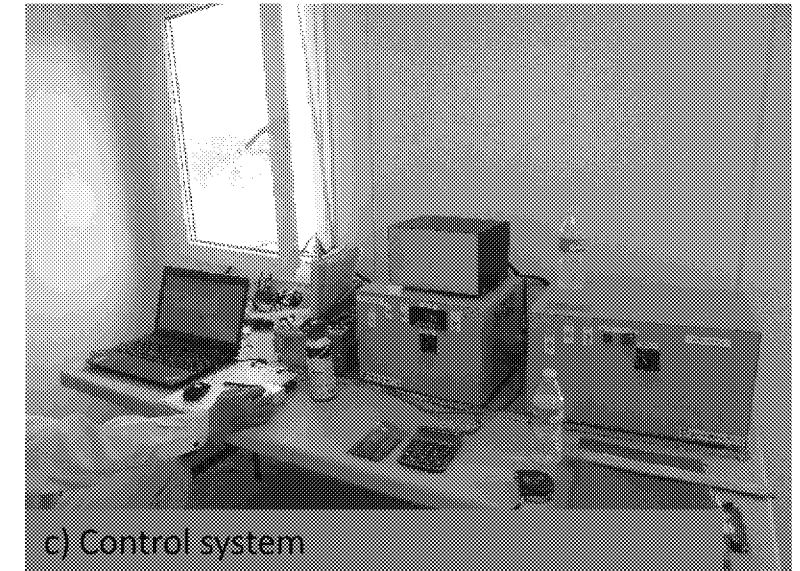
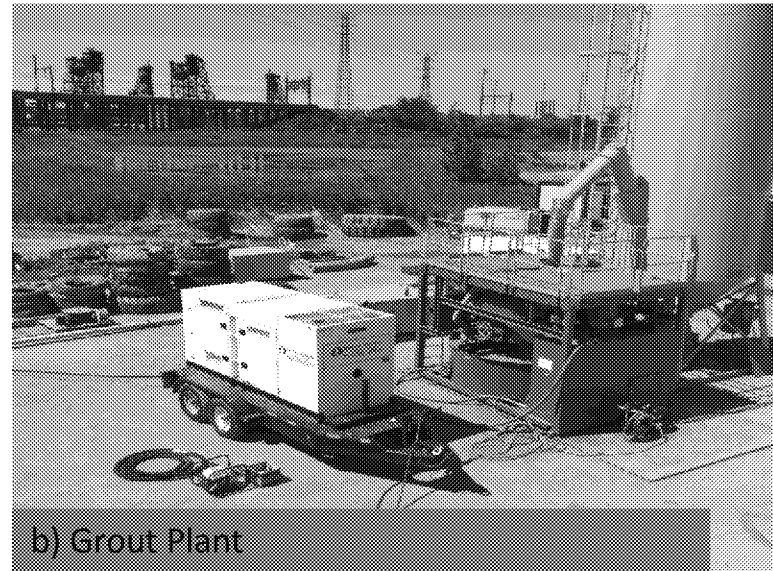
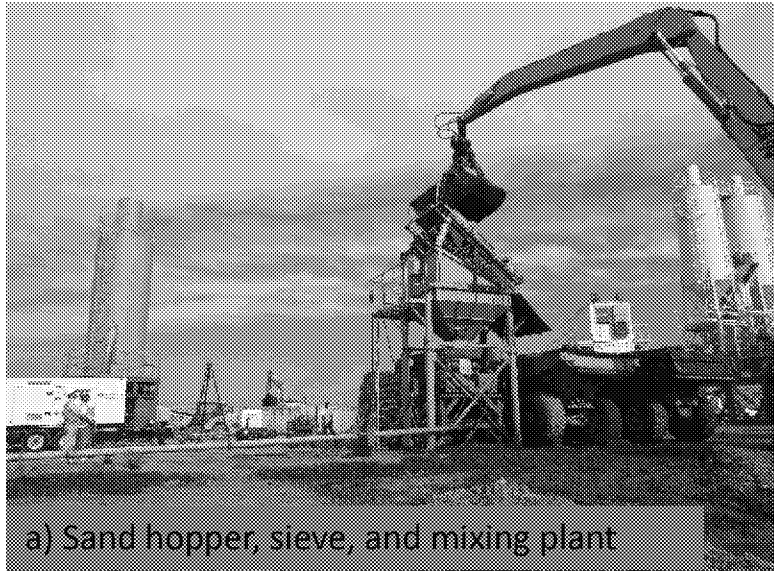
"Soft sediment is broken into "plugs" by compressed air. Plugs reduce pipe surface friction easing flow. During transport cement and clay are mixed by the turbulent flow within the 'plug' ." - Kitazume 2002



Automated system ensures that the binder dosing rates are correct. Real-time mass flow monitoring allows system to adjust to variable water content of the incoming slurry.



PFTM Process Flow – Land Based Option



Stabilized Material is transported as a flowable fill that will cure rapidly to facilitate transport or reuse



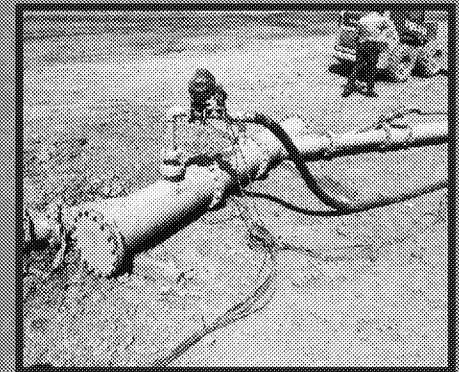
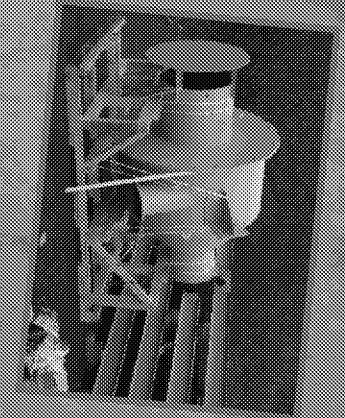
Pneumatic Flow Tube Mixer (PFTM) Operating Parameters

- Mixing and transport in a closed pipe system - Transport with air allows pumping amended material up to 3000 feet from processing site to staging area, placement site, or directly into railcars or scows.
- No water or air discharge (water treatment or mechanical presses)
 - No dewatering area and limited staging due to rapid curing; reduces the footprint needed
 - No waste water treatment plant needed
- Scalable: Three systems are available with capacities 60 CY/hr (500 CY/8hr Shift), 250CY/hr (2,000CY/8hr shift), 1250CY/hr (10,000 CY/8hr shift)
- Flexible deployment options – Entire system designed to fit on 160' x62' barge can be used in challenging applications with limited space available and great flexibility regarding transport to disposal location via pipe.
- Lower Costs
 - Automated system requires limited crew for operation
 - Extremely efficient use of binder due to Sensor driven feedback loop
 - High throughput and rapid curing allows for shorter deployments and reduced staging costs

PFTM 2000



PFTM 2000 Discharge



PFTM 500

Thank You

